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| 10/718,070 | 11/20/2003 | Hendrik F. Hamann | YOR920030368US1 (8728-643) | 8659 |
| 46069 | 7590 | 12/16/2005 | EXAMINER | |
| F. CHAU & ASSOCIATES, LLC 130 WOODBURY ROAD WOODBURY, NY 11797 | | | GEORGE, PATRICIA ANN | |
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/718,070

Applicant(s)

HAMANN ET AL.

Examiner

Patricia A. George

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 September 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) 14-21 & 24-25 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-13, 22 and 23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 14-21, 24 and 25 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

Claims 14-21 and 24-25 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to nonelected groups, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on September 22, 2005.

Applicant's election with traverse of group 1 in the reply filed on September 22, 2005 is acknowledged. The traversal is on the ground(s) that "simultaneous examination will not present an undue burden, much less any burden." This is not found persuasive because the inventions are distinct, each from the other because of the following reasons:

It would be a burden, to the examiner, to perform the variety of search strategies to discover prior art of:

material different process, for inventions II and I

different functions, for inventions I and III

different effects, for inventions II and II

Furthermore, there would be an additional burden, to the examiner, to determine the patentability of the fore mentioned separate inventions.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, 4, 5, 7, 11, 12, 13, 22, and 23 rejected under 35 U.S.C. 102(e) as being anticipated by Chen of US 6,927,410.

Chen disclosed all the limitations of claim 1: a multi-bit phase changing memory device (ab.), including: layers of phase change material (ab.) separated by layers of conductive interface (ab.), produced with varying degrees of resistivity (col.2, l.27).

As for claim 2, Chen disclosed the plurality of conductive layers (col.4, l.38-49) including a first outer conductive layer disposed at one side of the memory cell (fig.3, 26), and a second outer conductive layer disposed at a side opposite to the one side of the memory cell (fig.3, 28). Chen's figure 6, illustrates setting the electrical resistance of each of the plurality of phase change material layers in an increasing manner, sequentially, from layer 1 through later 5, pointing to a direction from the first outer conductive layer to the second outer conductive layer.

As for claim 4, Chen's figures 4A-G illustrate wherein each of the plurality of phase change material layers have a different phase transition temperature, also concealed in column 5, lines 23-26.

As for claim 5, Chen explains a method for operating a phase change memory having a volume of memory material, including a plurality of discrete layers of materials. The method includes applying heat to the volume of material for a predetermined amount of time (col.3, l.28-43), which demonstrates the following limitation claimed: each of the plurality of phase change material layers have the same phase transition temperature.

As for claim 7, in figure 3 (explained in col.4, l. 27-49), Chen illustrates a plurality of conductive layers (fig. 3, 26/24/28), including a plurality of intermediate layers (fig.3, 24), disposed between the first (fig.3, 26) and second (fig. 3, 28) outer conductive layers, each of the intermediate conductive layers (fig.3, 24) having the same dimensions as an adjacent phase change material layer.

As for claim 11, Chen discloses the phase change material layers are made of Ge.sub.2Sb.sub.2Te.sub.5 (col.4, l.52).

As for claim 12, Chen discloses the plurality of conductive layers are made of W, TiW, etc. (col.4, l.44).

As for claim 13, Chen demonstrates the number of phase change material layers corresponds to the number of possible bit values storable (col.4, l. 36-38).

As for claim 22, Chen expresses memory technologies can be read only, write once only, or repeatedly read/write which represents a programming circuit that writes data to the array of multi-bit phase change memory cells; and a sensing circuit that reads out data from the array of multi-bit phase change memory cells. All other limitations of claim 22, are discussed above.

As for claim 23, see discussion to claim 11.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 3, 6, 9, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen of US 6,927,410 (see discussion above) in view of Klersy et al. of USPN 5,536,947.

Chen fails to demonstrate the plurality of phase change material layers are of similar resistivity (as in applicants' claim 3), have different dimensions (as in applicants' claim 6); and are made of the same or different material (as in claims 9 and 10).

Klersy et al. teaches compositional modification of phase change materials, including use of any means to modifying the compositions, such as modifying: the volume to yield stable values of resistance, which points to the plurality of phase change material layers having different dimensions (as in applicants' claim 6); and the phase change material layers made of the same or different material, as in claims 9 and 10 (col.14, l.3-54).

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As for claim 3, Klersy et al. teaches, multiple layers of the same alloy may be present in the same volume (col.14, l.36-37), which demonstrates each of the plurality of phase change material layers could have the same resistivity.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to modify the invention of multi-bit phase changing memory device, of Chen, to include compositional modification, such as: of similar resistivity, having different dimensions, and of same or a variety of materials, as in Klersy, because Klersy teaches it is desirable to minimize drift of resistance values, a process improvement know to resolve problems with the storage of gray scale information.

Claim Rejections - 35 USC § 103

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen of US 6,927,410 (see discussion above) in view of Ovshinsky et al. of US 2004/0178401.

Chen fails to teach, the limitation to structure as recited in claim 8.

Ovshinsky illustrates all the limitations of claim 8 in figure 3, and explained in Example 1: a dielectric layer (60) formed between the first outer electrode (90) and the second outer electrode (30) and along sides of at least one other conductive layer (70) and a phase change material layer (80) disposed directly adjacent to the at least one other conductive layer (110).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to modify the invention of multi-bit phase changing memory device, of Chen, to include the structure of forming said device, as Ovshinsky, because

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Ovshinsky demonstrates a specific structure exhibits the ability to modulate the threshold voltage between two electrodes of a multi-terminal device by applying a control voltage to a control terminal. This modulation effect represents improved functionality because the structure includes a multi-terminal devices, a process improvement to the standard two-terminal devices.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: US 6,087,674; US 6,864,503; US 6,893,912; US 2003/0145257; US 2005/0112896.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patty George whose telephone number is (571) 272-5955. The examiner can normally be reached on weekdays between 7:00am and 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571)272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


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10/05

Patricia A George
Examiner
Art Unit 1765


NADINE G. NORTON
SUPERVISORY PATENT EXAMINER